# Best Management Practices not Implemented as Planned

The Gallatin NF conducted 2 implementation monitoring reviews in 2005 and 6 in 2007. These reviews were multi-disciplinary and multi-functional and designed to document whether provisions and mitigation in projects were actually implemented and effective. This process was BMP based and conducted in a similar format to the Montana Forestry BMP audits. The process included:

- Multi-disciplinary review of projects nominated by GNF staff
- Evaluation of project objective accomplishment & effectiveness
- Incorporates Montana Forestry BMP audit process
- Formally documents findings into reports
- Reports can be useful for future project planning, NEPA, Forest Plan Monitoring reports.

The 8 Implementation monitoring/BMP review projects included:

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| Karst Burn, Bozeman RD | 6/27/05 |
| MSTP Timber Sale, Livingston RD | 8/2/05 |
| Deer Creek Rx Burn Big RD | 6/29/06 |
| Baldy Timber Sale Livingston RD | 6/30/06 |
| Deer Creek Rx Burn Bozeman RD | 7/20/06 |
| Duck Creek Culvert Modification, Hegben Lake RD | 7/25/06 |
| Duck Creek Wetlands Hegben Lake RD | 7/25/06 |
| Taylor Fork S1 Watershed Rehabilitation Deer Creek Rx Burn Hegben Lake RD | 7/25/06 |

Each monitoring project was documented in monitoring reports summarized below.

**Karst Burn, Bozeman District**

The Karst Burn was about a 450 acre burn on 4/16/2005 which was part of the Gallatin Canyon North Fuels Reduction EA. The burn was ignited on the same day as the Asbestos Creek burn to the south using a PSD machine (aerial ignition with a helicopter). Fire carried well through the target area with good consumption of smaller fuels and ground fuels. The Karst fire was bounded on the north ridge of Karst Creek and on the south by Karst Creek.

The objectives of the Karst Burn were to provide a fuel break on the west side of the Gallatin Canyon in conjunction with the Deer Creek and Asbestos Creek burns. The Karst burn was located near several homes at the mouth of Karst Creek and was accompanied by the WUI treatments in a strip west of the homesites. Specific objectives of the Karst burn were to blacken 40-60% of the treatment area in a mosaic fashion, with 50% mortality in mature trees in

grass/shrub habitat and 60% or greater mortality in conifer seedling/sapling. The Karst Burn Plan included acceptable results of blacken 40% of aspen clone areas, and reduce decadent and/or nonproductive big sagebrush by 40-60%. The review team observed achievement of these specific objectives and results throughout the Karst burn. Five BMP's were reviewed using the Montana Forestry BMP audit criteria. These included 2 soil/water/aquatics and 3 air quality project specific mitigation measures from Table 2-2 (page 2-6) of the Gallatin Canyon North EA.

BMP application, BMP effectiveness, and BMP descriptive definitions, which apply to the Karst Burn and the other 7 projects reviewed in 2005 and 2006 include:

BMP Application
5- operation exceeds requirements of BMP
4- operation meets requirements of BMP
3- minor departure from BMP
2- major departure from BMP
1- gross neglect of BMP

BMP Effectiveness
5- improved protection of soil and water resources over pre-project condition
4- adequate protection of soil and water resources
3- minor and temporary impacts on soil and water resources
2- major and temporary or minor and prolonged impacts on soil and water resources
1- major and prolonged impacts on soil and water resources

BMP Definitions

Adequate - small amount of material eroded, does not reach draws, channels, or floodplain
Minor - erosion and delivery of material to draws but not stream
Major - erosion and subsequent delivery of sediment to stream or annual floodplain
Temporary - impacts lasting 1 year or less, no more than 1 runoff season
Prolonged - impacts lasting more than 1 year

| Evaluation Items - BMP's | source | Applic | Effect | Comments |
|---|---|---|---|---|
| **Prescribed Fire BMP's** | | | | |
| 1. no burn buffer of 100' between burn treatment areas and perennial streams would be retained. | EA Table 2-2 Project Specific Measures | 3/4 | 4 | 2 spots on west side of burn and 1 on east side had burn closer than 100'. No erosion or sediment occurred in these areas. |
| 2. Natural terrain breaks, existing roads, and snow at higher elevations would be used to contain the burn area. No ground disturbing containment methods would be used. If ground disturbing fire suppression activities are needed in an escape situation, MIST would be used if possible. | EA Table 2-2 Project Specific Measures | 4 | 4 | East end of burn (near Karst subdivision) was monitored by a 3 person crew. No handline construction or other ground disturbing was needed. |
| **Air Quality** | | | | |
| 1. Place warning signs along Highway 191 to inform drivers of | EA Table 2-2 Project Specific | 4 | 4 | Warning signs were placed along Highway |

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| reduced visibility due to preseribed burns during adctive periods of Rx burning | Measures | | | 191. |
| 2. Rx burning would occur during springtime when north slopes are still moist form snowmelt, wind dispersion is robust, and wildfire potential very low | EA Table 2-2 Project Specific Measures | 4 | 4 | The Karst met all of the spring burn project specific measures for moist north slope confinement, good wind dispersion, and low wildfire potential |
| 3. Coordinate all GCN burning activities with the Montana/Idaho State Airshed Group | | 4 | 4 | The Karst and Asbestos Creek burns were posted on the airshed group RAZU 3 days in advance and dispersion forecast checked prior to burning. The state airshed group had no restrictions and smoke impacts were well within the levels and dispersion patterns anticipated in the EA. |

Much of the Karst burn occurred on 50-70% slopes and burned all surface vegetation, much of the surface fuel and lightly into duff. Burn intensity was generally low-moderate with very localized small pockets of high intensity. Between 4/28/05 and 6/27/05 the Shendango RAWS site (7.5 miles north at 5700 elevation) recorded 8.9" of precipitation. No RAW's precipitation data at the site is available from 4/17 – 4/27. Elevation of the Karst burn varies from 6100 to 8000 feet. Actual 4/17 to 6/27 precipitation on the Karst burn was at least 10 inches. The precipitation was largely frontal storm source with moderate precipitation intensity. No rill, sheet, or gully erosion was observed on any of the areas examined on the Karst burn.

On the western edge of the Karst burn the burn perimeter was within 100' of Karst Creek in 2 spots. Revegetation was robust and no erosion or sedimentation occurred. This is a minor departure of the project specific mitigation measure "BMP's". In helicopter ignitions where some downslope burning can occur retaining a 100' no burn buffer is difficult. In future Gallatin NF spring burns no burn buffers are recommended to be reduced to 25' to 50' which is attainable and adequate for most burns.

**MSTP Timber Sale , Bozeman District**

The MSTP timber sale contract #06-018107 was awarded in 3/2000 and is a combination of sales approved by decisions made for the Moose/Swan/Tamphery timber Sale EA and Portal Timber sale EA's in 1999. Sale contractor is Louisiana Pacific Lumber of Belgrade. During the last 2 years sawlogs were delivered to RY Timber of Livingston since LP sold the Belgrade mill. Total sale volume was about 4.1 million board feet with the logging being done in 8 tractor units, 10 skyline (cable) units, and 11 helicopter units. Approximate acres by subdivision include Swan (1,600 acres), Moose Tamphery (5,580 acres), and Portal 1,220 acres). About 2.7 miles of new specified road construction and 8.7 miles of road reconstruction are included in the contract. Purchaser burning of land piles on the cable units was cooped back to the Forest Service. Due to heavy fuels, some units were broadcast burned. Much of the fuel reduction work was done by the GNF after sale contract termination. The MSTP sale was part of the Big Sky Land Exchange process in which timber sale receipts were collected from several sales to purchase part of the lands which were conveyed to the GNF.

Specified road BMP #4 was rated 2 (major departure) for application and 3 (minor and temporary impacts) due to an insufficient number of drainage dips. The review team concluded that more specified road was constructed than would have been necessary to access may of the units. No provisions were made to decommission the specified roads after sale closure.

The temporary road into unit 30 was closed with scarification (6" to 14"), seeded, fertilized, and covered with slash. Administration of this contract clause (C6.623) and subsequent soil and water protection was adequate. Most of the MSTP soil and water BMP's met requirements with adequate protection of soil and water resources. The main BMP departures were inadequate specified road drainage and soil impacts greater than the 15% soil disturbance guidelines in tractor units due to site preparation. Sedimentation impacts to Moose and Tamphery Creeks of the MSTP sale were very minor due mainly to the upper and mid-slope position of most of the units and roads.

**Deer Creek Rx Burn , Big Timber RD**

The purpose of the Deer Creek implementation review was to compare burn results with burn objectives with specific emphasis on weed/watershed BMP's, AMP coordination, and air quality mitigation measures. The focus of the review was on the 2000 acre Castle Enos burn (April 10-13, 2006), which is the third of the Deer Creek burns after Bohee (2001) and Dore (2003).

Castle Enos review team on June 29, 2006. The team walked through much of the northern end of the treated area and evaluated 13 review items (objectives and mitigation measures).

For the Castle – Enos burn the Range of Acceptable Results (Burn Plan page 5) included:

1) Increase the vigor and productivity of burning in a mosaic pattern in the open grass and shrub land.

2) Increase or maintain early succcession: burning in a mosaic pattern with 40% to 60% of the area blackened and maintain 90% of the 10” diameter and greater trees.

3) Re-establish aspen communities: all encroaching conifers cut or burned in aspen stands, 30% to 50% blackened area.

4) Maintain open coniferous habitats: areas composed primarily of dense, pole-sized trees burned in entirety as a stand replacing burn with 30% to 60% of the trees blackened but maintain 95% of trees 10” in diameter or greater.

For the Castle – Enos burn the Range of Acceptable Results (Burn Plan page 5) included:

5) Increase the vigor and productivity of burning in a mosaic pattern in the open grass and shrub land.

6) Increase or maintain early succcession: burning in a mosaic pattern with 40% to 60% of the area blackened and maintain 90% of the 10” diameter and greater trees.

7) Re-establish aspen communities: all encroaching conifers cut or burned in aspen stands, 30% to 50% blackened area.

8) Maintain open coniferous habitats: areas composed primarily of dense, pole-sized trees burned in entirety as a stand replacing burn with 30% to 60% of the trees blackened but maintain 95% of trees 10” in diameter or greater.

The Castle Enos burn was conducted on an area of highly dissected, shallow Livingston-volcanic-derived soils. Vegetation is predominantly open juniper/sage/forb meadows with Douglas-fir in draws and north slopes. Fuels are very light which limits burn spread. The burn was accomplished from April 10-13, 2006 and was complicated by “greening” of the understory as well as residual moist conditions in many of the Douglas-fir stands. The burn crews were very careful to maintain the burn under the Burn Plan prescriptions which resulted in a safe burn but hampered accomplishment of burn objectives.

The Deer Creek burns (Bohee, Dore, and Castle Enos) have not resulted in as much forage increase as the 1994 Black Butte Burn (which enhanced grass forage production over a large area including part of the Cherry Creek watershed). The Castle Enos prescribed Rx fire was accomplished within the 2/06 Burn Plan prescription. However, the burn was very difficult to accomplish due to remote and rugged

terrain, large size (2000 acres), sparse and sporadically spaced fuels, residual moisture in Douglas fir stands, and onset of greenup which retarded flame spread. The percent of burned area accomplished was less that the Burn Plan and NEPA as the objectives ratings indicate. Large areas were deferred from burning, however, and the actual accomplished acreages were close to the Burn Plan. The Castle Enos burn NEPA envisioned a landscape level project but the FY2006 budget realities of the fuels targets made it difficult to accomplish the objectives given the limited personnel time and large acreage targets. A higher cost per acre could allow for other methods of RX burning which may result in a more effective bun and a larger window (i.e. aerial ignition). Fuel conditions within the Castle Enos area in April 2006 were quite variable with sparse fuels on south facing sage/grass slopes, accelerating spring green up, and residual winter moisture in Douglas fir stands. The "burn window" was very brief and fuels to carry the fire was sparse especially in the northern part of the unit. After 1 or 2 rotations through the pastures, the amount of fine fuels to carry fire to the larger fuels will increase the success of meeting burn objectives.

The EA and S18 AMP constraints on the Cherry Creek allotment permitees (1 season rest before burn, rest 2nd year and most of 3rd year) have complicated the permittees operations. The results of the Deer Creek burns (Bohee, Dore, and Castle Enos) have not resulted in as much forage increase as the 1994 Black Butte Burn (which enhanced grass forage production over a large area including part of the Cherry Creek watershed). The grazing constraints are complicated to administer since to operate per the S18 table the permitees must rest a pasture a year prior to a burn which may or may not be accomplished due to the generally short burn windows and difficulty of burn plan implementation. Adjusting the grazing schedule for the areas based on primary and secondary range may be an option. Much of the Castle Enos Rx burn project area burned in in the Derby Fire in September of 2006 which will negate or require updating many of the conclusions and findings in the review.

**Baldy Timber Sale, Livingston RD**

The Baldy Peak Timber Sale EA was released on 12/3/1998. The Baldy Timber sale contract #02-018099 was authorized in a Decision Notice and FONSI 5/6/1999, and awarded on 12/20/1999. The Sale contractor is Pyramid Mountain Lumber Inc. of Seeley Lake, Montana. The sale contract terminates on 7/31/2006. Total sale volume in the DN was 1.93 MMBF on 357 acres with the logging being done in 16 tractor units, 2 skyline (cable) units, and 1 skyline swing yarding specified unit. About 1.1 miles of new specified road construction and 3.0 miles of road reconstruction (spot surfacing, and some new drainage structures) were included in the contract.

Unit 4 was winter-logged in 2000/2001 with whole-tree yarding and tractor skidding. The winter logging treatment had very little soil disturbance with a few disturbed spots due to snow displacement and soil exposure. The unit was not scarified as the objectives did not include regeneration augmentation. Overall soil disturbance was estimated at about 5% which is well within the USFS R1 15% soil disturbance standard.

Skid trail used to access Unit 10 which was harvested in January and February of 2006. Approximately 200-300 skidder passes (whole tree yarding) occurred on this trail which is below a convergence of 2 skid trails above. Winter logging (snow cover protection) satisfactorily protected soils. Overall soil disturbance was judged to be less than 15% and in compliance with the USFS R1 15% soil disturbance standard. The timber sale administrator reviewed this skid trail the following spring (April 2006) and judged that additional scarification and water bar construction were not necessary.

Overall, the Baldy Timber Sale provided adequate erosion protection. The winter logging over snow-covered and frozen ground greatly reduced potential ground disturbance. The lack of site preparation resulted in very limited soil disturbance. Vegetation recovery of logged and disturbed sites (skid trails and roads) has been robust. The USFS R1 15% soil disturbance standard was met in all of the areas examined. Potential soil disturbance (compaction, displacement, smearing) was judged to be less than 10% overall in the Baldy Timber sale area. This was accomplished by use of the existing road network with limited new construction, winter logging (which greatly reduces soil damage potential), and at least a 75' spacing between skid trails. No evidence of water quality impacts occurred from the Baldy Timber sale. Although the sale has no perennial streams, a few small ephemeral tributaries occur in the lower end of the sale along road #2533. Water quality protection BMP's (no riparian harvesting, no side casting of road material into streams, no slash in streams) were very effective.

The winter logging C6.623 provision for logging when snow is between 4" and 14" worked well although snow frequently exceeded 14" with no adverse constraints on logging operations. Skid trails in the winter had generally light impact with no need to require spring water bar construction, which would have increased site impact. The one exception is the skid trail in Unit 9 which needed slash placement in the lower end to reduce erosion potential until the trail re-vegetates.

**Deer Creek Rx Burn Bozeman RD**

The Deer Creek burns were authorized in the Gallatin Canyon North Fuels Reduction Project Environmental Assessment (EA) of November 2003, and Decision Notice (DN) and Finding of No Significant Effect (FONSI) of March 2, 2004. The Deer Creek Prescribed Fire Plan (April 13, 2006) provided specific vegetation treatment objectives. The Gallatin Canyon North DN included prescribed burning of up to 2,700 acres, and reduction of conifer encroachment by mechanical means in other areas. The EA Appendix A (Best Management Practices) and Appendix B (Soil Protection Practices) did not specifically apply to the Deer Creek burn as they were included for the timber harvest/thinning areas of the Gallatin Canyon North project (Jack Smith North mechanical treatment unit, Tamphery, Swan, and Levinsky understory thinning units). Overall project objectives included the following:

1. Create a more defensible area in the WUI by reducing the fire severity risk and crown fire hazard, thus reducing the risk of damage to life and property.

2. Maintain and expand areas of low fire severity risk (condition class 1) by reducing conifer encroachment.

3. Begin the reduction of the risks and consequences of wildfire within the Lee Metlalf Wilderness

to an acceptable level, including decreasing potential for wildfire escape to a WUI, and increase the safety and predictability of wilderness wildfire as a prescribed natural fire for ecosystem purposes.

The Range of Acceptable Results (Burn Plan page 6) included:

1. Hazard Reduction – 40% mortality rate in mature trees and 80% mortality rate in small trees are desired in the open forest (fuel model 8). A 80-100% mortality rate is desired for mature and small trees in the open areas with scattered trees (fuel model 2).

2. No site preparation.

3. Wildlife Habitat - 40% to 60% reduction of big sagebrush that has become decadent and/or non-productive.

The review team reviewed much of the Deer Creek D6 burn unit on July 20, 2006.

| Evaluation Items - BMP's | source | Applic | Effect | Comments |
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| **Deer Creek Prescribed Burn Plan Objectives** | | | | |
| 1. Maintain and expand areas of low fire severity risk (condition class 1) by reducing conifer encroachment | Rx Fire Plan pg. 6 | **4** | **4** | -the implication of this objective is that the area will require periodic treatment to maintain desired condition |
| 2. Hazard Reduction – 40% mortality rate in mature trees and 80% mortality rate in small trees are desired in the open forest (fuel model 8). A 80-100% mortality rate is desired for mature and small trees in a the grassland with scattered trees (fuel model 2) | Rx Fire Plan pg. 6 | **4** | **4** | - in many treated areas the burn exceeded objectives for tree mortality<br><br>-achieved mosaic of burned and unburned stands |
| 3. No site preparation | Rx Fire Plan pg. 6 | **4** | **4** | -typically not required for a spring burn |
| 4. Wildlife Habitat - 40% to 60% reduction of big sagebrush that has become decadent and/or non-productive | Rx Fire Plan pg. 6 | **4** | **4** | -achieved mosaic burn pattern objective but the definition of decadence was |

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| | | | | ambiguous<br>- difficult to discern between young heathy and decadent sage with aerial ignition |
| **Deer Creek Prescribed Burn Project Specific Mitigation Measures** | | | | |
| **Air Quality** | | | | |
| 1. Place warning signs along Hy 191 to inform drivers of reduced visibility during active burning periods | DN pg. 15<br>EA pg. 2-6 | **5** | **4** | -also placed highway sign listing broadcast channel for additional information on burn<br>-also posted personnel in parking areas |
| 2. Smoke column density and direction of travel monitored. Ignition may be altered to minimize the smoke impact on HY 191 | Rx Fire Plan pg. 13 | **4** | **4** | -on 4/22, some smoke settled to valley bottom<br>-smoke on 4/29 and 5/19 had robust plume height and dispersed with minimal impact to valley bottom |
| 3. Coordinate burn with Montana/Idaho Airshed group | Rx Fire Plan pg. 13, DN pg. 17, EA pg. 2-6 | **4** | **4** | -followed standard RAZU procedures, obtained MT/ID Smoke Unit approval |
| 4. Prescribed burning in springtime | DN pg. 17,<br>EA pg. 2-6 | **4** | **4** | April 22, 29; May 19 |
| **Water Quality** | | | | |
| 1. No-burn buffer of 100 feet between burn treatment areas and perennial streams | DN pg. 17, Rx Fire Plan pg. 11 | **4** | **4** | -recommended buffer width changed to 50 feet (as for Karst burn), although actual buffer was well over 100 feet |
| 2. Natural terrain breaks and snow used to contain burn area. No ground disturbing containment methods. MIST techniques if fire escape | EA pg. 2-7 | **4** | **4** | -blacklining used to connect snowbanks<br>-no fire escaped boundaries |
| **Native Plants and Weeds** | | | | |
| 1. Native range burned before the Idaho fescue greens up. May require several entries and burning at different elevational bands. | DN pg. 15<br>EA pg. 2-7 | **4** | **4** | -three entries<br>-vigorous Idaho fescue growth observed in burned areas |
| 2. Hounds tounge treated for at least 5 years. Responsibility of weed program manager. | DN pg. 15<br>EA pg. 2-7 | nr | nr | -not rated—ongoing<br>-Pre-treatment removal effort consisted of a 30-person hand crew (summer 2003) |
| 3. Staging areas for helicopter inspected to ensure weed free. | DN pg. 15<br>EA pg. 2-7 | **4** | **4** | -helicopters did not land in wilderness area |
| 4. Yellow toadflax below Deer Creek powerline flagged and avoided during burning. | DN pg. 15<br>EA pg. 2-7 | **4** | **4** | |
| 5. Previously unidentified weed populations mapped and weed | Rx Fire Plan pg. 9 | **4** | **4** | -no additional weed populations identified |

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| specialist notified | | | | during project |
| 6. Big sagebrush burned in a mosaic pattern with at 40 to 60% of non-productive sagebrush burned. Non-productive sagebrush is characterized by having conifer encroachment and is generally unhealty and losing viability. | DN pg. 17 | **4** | **4** | - mosaic of burned and unburned sagebrush acceptable with DN and burn plan objectives but D6 Wildlife Biologist concerned that young, health sage was burned in equal or greater proportion than decadent sage.<br>-overall reduction in sage did not exceed 40-60% |
| **Wilderness** | | | | |
| 1. Helicopter use mimimally as posisible. Access by foot unless cannot safely. | DN pg. 16 | **4** | **4** | -helicopters did not land in wilderness area |
| **Wildlife** | | | | |
| 1. Helicopters for aerial ignitions use Gallatin Canyon corridor rather than high elevation cirque areas (avoids potential denning habitat for grizzly bears and wolverine). | DN pg. 16<br>EA pg. 2-9 | **4** | **4** | |
| 2. Low level helicopter flights <4 hrs day (grizzly bear denning) | DN pg. 16<br>EA pg. 2-9 | **4** | **4** | -no more than three hours each day |
| 3. One year between Dudley, Deer, and Asbestos Creek burns (bighorn sheep), unless area population recovered to specified levels | DN pg. 16<br>EA pg. 2-9 | **4** | **4** | -sheep population had stabilized by date of burn<br>-1 year interval adhered to anyway<br>-Montana FWP satisfied with efforts |
| 4. Helicopter pre-flight to ensure bighorn sheep not concentrated in a burn area | DN pg. 16<br>EA pg. 2-9 | **4** | **4** | |

Areas of burned conifers in the Deer Creek burn showed good vegetation recovery 2-3 months after the burn.

The overall goals of the Deer Creek prescribed burn were met:

a. Conifer encroachment was reduced
b. Good mosaic pattern in burned conifer stands
c. Sagebrush areas were treated in a mosaic pattern and mortality was limited to no more than 60%.
d. The burn plan was clearly written and well-executed by the ground and air crews.

2. Robust fire runs were observed in the lodgepole pine stands despite spring conditions. The large size and scope of this burn were major steps for the D6/D7 Gallatin NF Fuels team. Idaho fescue plan/mitigation worked well—burned fescue habitat showed particularly strong fescue growth at the time of the review. Soil and water resources were protected. In nearly all burned areas, ground vegetation recovery was vigorous. In areas where ground vegetation remained sparse, no signs of soil erosion were evident. The duff layer was minimally burned throughout the unit which greatly reduces the potential for increased runoff. Multiple entries were a key to the successful implementation of the Deer Creek D6 burn. This was especially important for avoiding damage to Idaho fescue.

## Duck Creek Culvert Modification, Hegben Lake RD

The Duck Creek project was initiated to improve fish passage by eliminating a 3 foot drop at the outflow of the U.S. 191 Duck Creek culvert. For many years rainbow trout spawning in Duck Creek, a major spawning tributary to Hebgen Reservoir, have had to jump approximately 2 ½ - 3 vertical feet into fast flowing water at the outflow of the Duck Creek culvert to access spawning areas in upper Duck Creek and its tributaries in Yellowstone Park. Empirical observation revealed about 1 jump in 10 lead to successful passage of the culvert, implying that a fish had to attempt 10 jumps before successfully passing the culvert and expend excessive energy in the process. Forest Service hydrologists and engineers estimated from the discharge-date graph that migrating rainbow trout could negotiate the culvert for about 6-8 days of the 2-month spawning period. While delayed in a large pool below the culvert, fish were at an increased vulnerability to predators such as otters, osprey, and anglers.

To eliminate the drop, a cooperative effort by the Gallatin National Forest (GNF), Montana Fish, Wildlife and Parks (MFWP), Montana Department of Transportation (MDT), and PPL Montana culminated on August 26, 2005 in the construction of a cascade comprised of boulders and fill material which effectively raised the streambed and water level. The area impacted by heavy equipment was reseeded with Idaho fescue in September 2005. Erosion control fabric was applied to a steep, erosion-prone bank. On June 10, 2006, volunteers from the Madison-Gallatin Chapter of Trout Unlimited assisted GNF staff with planting 300 willow cuttings to complete site revegetation.

| Evaluation Items - BMP's | source | Applic | Effect | Comments |
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| **Duck Creek Fish Passage Objectives** | | | | |
| 1. Place boulders and fill at the outflow of the Duck Creek Culvert to raise the streambed and eliminate the jump. | FS Agreement # 04-PA-11011107-027 | 4 | 4 | A significant pre- to post-project increase in age-0 mountain whitefish was observed through out-migrant trapping. |
| **Duck Creek Fish Passage Mitigation/Rehabilitation Accomplishment** | | | | |
| 1. The project will only effect the stream channel immediately downstream of the project. | SPA 124 Permit | 4 | 4 | No upstream effects and downstream effects limited to area immediately downstream of project. |
| 2. Surface disturbance will | SPA 124 | 4 | 4 | Heavy equipment |

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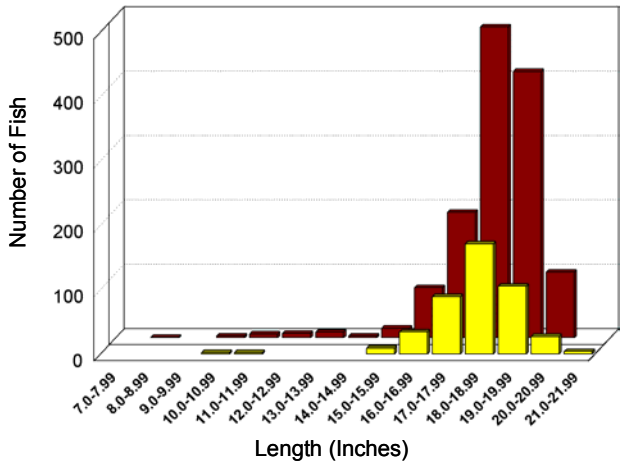
| be limited to approved access routes, work areas, and stockpile areas. | Permit | | | use was restricted to pre-approved routes. |
| 3. Disturbed areas will be scarified to relieve compaction and revegetated. | SPA 124 Permit | 4 | 4 | Completed 2006 |
| 4. Construction activities will occur in August and not interfere with spawning fish. | SPA 124 Permit | 4 | 4 | Work completed August 2005 |
| 5. The project will not alter flow regimes or exacerbate erosion problems. | SPA 124 Permit | 4 | 3-4 | Some bank erosion observed immediately downstream of project but may be attributed to high spring runoff. |
| 6. Monitor effectiveness through annual field surveys for at least two years including but not limited to adult and juvenile trapping and redd counts. | FS Agreement # 04-PA-11011107-027 | 4 | 4 | Monitoring implemented as described in 2006. |

U.S. Highway 191 Duck Creek culvert with three-foot drop before constructing the fish passage structure.

**Following construction of the boulder cascade, the bottom of the Duck Creek culvert is level with the streambed.**




Length frequency distribution of adult rainbow trout captured upstream of the Duck Cr. culvert during May and June 2005 (yellow bars) before the boulder cascade was constructed and during May and June 2006 (red bars) after the cascade was constructed.

The Duck Creek fish passage project was successful at eliminating the jump at the outflow of the U.S. 191 culvert and improving fish passage. The number of out-migrating age-0 mountain whitefish and brown trout increased dramatically from 2005 to 2006 most likely due to increased passage of fall spawning adults in 2005 (Figure 4). In addition, adult rainbow trout captured upstream of the culvert in 2006 comprised smaller size classes than those captured in 2005 indicating that smaller fish were able to pass through the culvert after modification (Figure 5). Although passage has been substantially improved, the culvert remains below Forest Service fish passage standards. The culvert has a steep section at the downstream end with velocities which may continue to impair passage of some fish species with lower swimming performance such as mottled sculpins.

Given the limitations of the culvert that remained after eliminating the drop, pre- and post-project fish population monitoring was critical to rating this project as successful. Cooperation among the GNF, MFWP, MDT, and PPL Montana was essential in funding this project.

## Duck Creek Wetlands Hegben Lake RD

The Forest Service worked in partnership with the Trust for Public Lands (TPL) to complete the purchase of the 413-acre Duck Creek wetlands property and add this valuable land to the Gallatin National Forest. TPL first purchased the property from Duck Creek Partners, LLC, and then re-conveyed it to the Forest Service in two phases, in 11/04 and in 9/05, as federal LWCF funding became

available. The Duck Creek wetlands provide valuable grizzly bear habitat, crucial wildlife migration paths, and key habitat for a wide variety of waterfowl and trout species. The wetlands also provide important scenic values and recreation opportunities. Subdivision and development were planned for the Duck Creek land prior to its purchase by the TPL.

The landowners, TPL and Forest Service completed four key actions to remove conflicting developments and encumbrances from the property, and to enable the Forest Service to take clean title and manage it as NFS land. These included: Terminate the lease for the Duck Creek gravel pit and close, rehabilitate and restore that gravel pit site. Remove the residence and other improvements from the purchase property and restore that site. Exclude the site of the Log Home business from the purchase land, so this small business can remain in operation, and secure a "right of first offer" to TPL to purchase in future. Arrange for Gallatin County to abandon rights it evidently held to the east-west portion of the old County road that traversed the property, so that the Forest Service can better manage the land for wildlife objectives.

Duck Creek wetlands gravel pit area site on 7/25/06. The gravel pit required considerable reclamation including removing wire, culvert pieces, cable, metal scraps, scale, scale shack, fence, waste asphalt, and containers. The pit was shaped, then harrowed and reseeded. The high water table in the pit has formed a pond with potential for tree/shrub planting, fish introduction, and recreation facilities

## Taylor Fork S1 Watershed Rehabilitation Hegben Lake RD

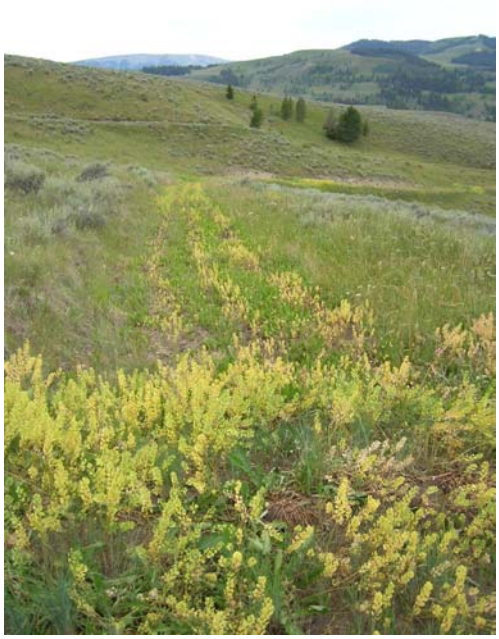
The Taylor Fork project focused on watershed rehabilitation with benefits to water quality, fisheries, wildlife habitat, recreation and visual quality. In 2002 and 2003, the Gallatin National Forest, Trust for Public Lands, and the 320 Ranch completed a significant Land Conservation project in the Taylor Fork drainage. The purpose of the "320 Ranch - Taylor Fork project" was to acquire over 3,400 acres of critical private lands in the Taylor Fork, in order to conserve critical habitat for elk, moose and grizzly bear, protect streams, water quality and fisheries, preserve historic recreational opportunities, and to avoid future subdivision and development. Congressional and public support for the project was extensive. Consolidating public land in the Taylor Fork area has benefits for multiple resources. This area is prime habitat for wildlife (grizzly bear and elk) and fisheries (westslope cutthroat trout). The Section 1 developments were visually very impactive with considerable public expectation for restoration with the transition to National Forest management. The developments and associated erosion and sedimentation problems were a major reason for inclusion of Taylor Fork on the Montana DEQ 303(d) list in 1996. Removing the developments (road prism, cabin sites, and culverts) in Section 1 was intended restore the area to a more stable and natural condition and a major part of the 303(d) list water quality compliance action plan and the Taylor Fork 4(b) BMP plan (August 2005).

The goal of this project was to rehabilitate Section 1, T9S R3E by removing the formerly private land developments. Before Section 1 was acquired, 7 miles of new roads and 32 cabins were constructed. NEPA requirements for this restoration project were completed in 2002 with the Taylor Fork Timber Sale

and Road Restoration EIS (10/2000). Additional requirements were added in the 320 Ranch – Taylor Fork Land Acquisition and Related Land Use Actions DN and FONSI (4/2002). The S1 cabins were removed in 2004 and the roads decommissioned in 2005. The project consisted of removing cabins and a variety of road treatments including ripping, re-contouring, hydro-mulch, seeding, and erosion blankets, on about 15 acres on 13 sections of road.

| Evaluation Items - BMP's | source | Applic | Effect | Comments |
|---|---|---|---|---|
| **Taylor Fork Section 1 Treatment Objectives** | | | | |
| 1. TPL purchase approximately 3,400 acres of land in 6 sections in 2 phases and convey to the USFS including 627 acres in S1 | 320 Ranch – ROD 4/2002 pg. 2 | 4 | 4 | Completed in 2002 and 2003 |
| **Taylor Fork Section 1 Treatment Accomplishment** | | | | |
| 1. Remove 29 cabins and the fence in S1. | 320 Ranch – ROD 4/2002 pg. 4 | 4 | 4 | completed fall of 2004 |
| 2. Road closure and restoration of roads on offered lands in S1 – ripping, seeding, and stabilization of land in the old road beds. | 320 Ranch – ROD 4/2002 pg. 5 | 4 | 4 | stabilization satisfactory |
| 3. Obliterate existing roads that are closed to public motorized use in Taylor Fork to reduce sediment delivery and improve native fisheries habitat. | Taylor Fork TS and Road Restoration EIS pg. 6 | 4 | 4 | no evidence of erosion from any treated road segments. |
| 4. Forest Service designates the seed mixture to be used in road rehabilitation activities. | Taylor Fork TS and Road Restoration EIS pg. 23 | 3 | 2 | Forest Service designated seed mixture which was certified as “weed free”. However considerable field penny cress was evidently in the seed mix with considerable growth on treated areas. |
| 5. Monitor effectiveness of the existing road closures over next 5 years (2001-2006) | Taylor Fork TS and Road Restoration EIS pg. 25 | 4 | 4 | Road closures throughout the Taylor Fork drainage have been consistently monitored over the last 5 years with satisfactory compliance |

Former cabin site in the north east part of Section 1. Twenty nine of the 32 cabins were removed in the fall of 2004 and the cabin sites reclaimed.



Ripped and drained road on the north side of section 1. These north facing roads had more organic soils than the harsher south facing slopes and had excellent germination of the grass seed mix. No erosion on these ripped roads was occurring. The field penny cress in the seed mixture (annual species), however, provided a robust response.

TPL purchase in Taylor Fork was quite successful in acquiring private lands for conversion to the National Forest system. The purchase and cabin removal required considerable long term diligence on the part of TPL and the Forest Service. The re-contouring and ripping treatments of the roads were very effective in stopping erosion from the road surfaces and preventing sediment sources. Grass establishment from re-sprouting or in the seed mix has been satisfactory. Re-vegetation efforts, however, have been compromised by weeds, evidently in the seed mix (field penny cress) which have robustly established in several of the seeded areas. Recreational guided horse use from the Nine Quarter Circle Ranch is very heavy over the treated area which is compromising re-vegetation in several of the reclaimed road segments.

The Taylor Fork Section 1 project will be reviewed in future years to assure vegetative recovery of treated areas.